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# Integration of Non-Oracle Software into an Oracle Application: The Implementation of Financial EC/EDI at Lawrence Livermore National Laboratory

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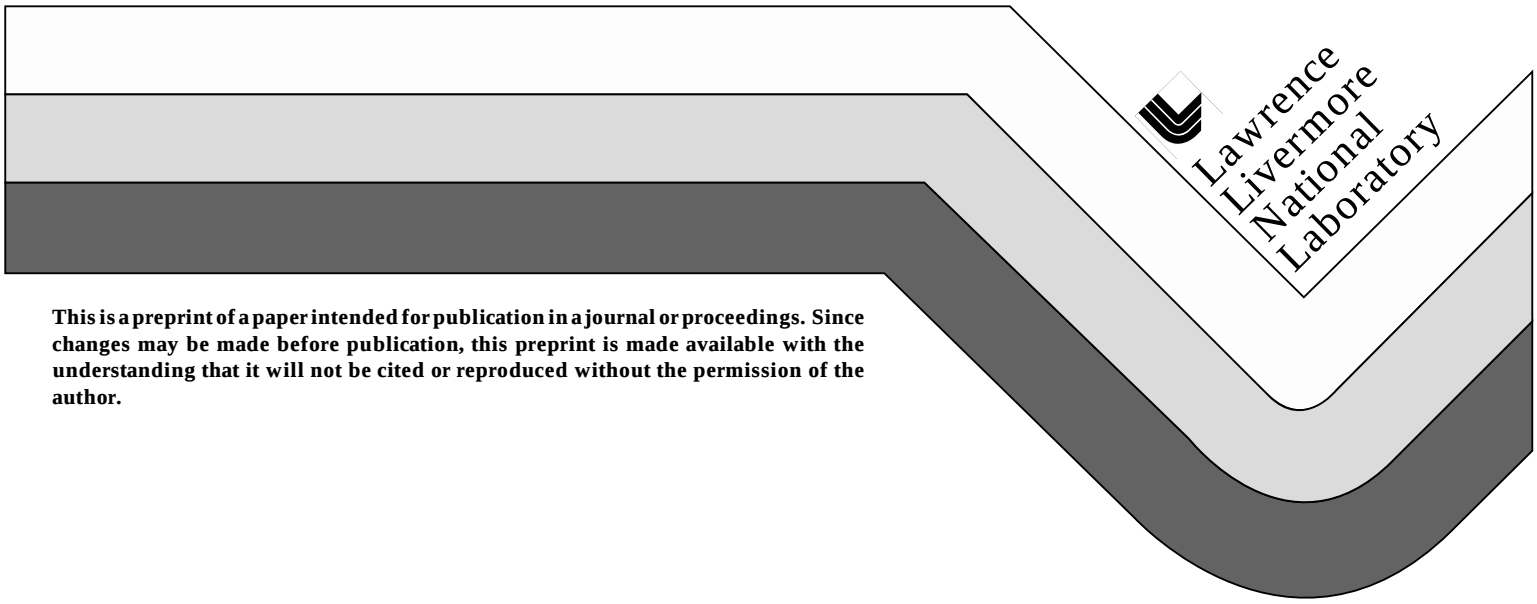

# Integration of Non-Oracle Software into an Oracle Application:

# The Implementation of Financial EC/EDI at Lawrence Livermore National Laboratory

Electronic data interchange (EDI) is the first universally visible catalyst for permanent change in the way that intercompany and interpersonal business will develop. It marks the beginning of a profound evolutionary change in business practices. EDI is in the forefront of applications for the converging technologies of communication and computing coupled with global trading markets. The marked difference in EDI and other emerging technologies is that EDI was designed for the end user to apply, not the information systems specialist or the network communications guru. Fundamentally, EDI is the interorganizational computer-to-computer (and, preferably, application-to-application) transfer of data representing business documents in an agreed format or standard. It is a rapidly growing network application that addresses a business fundamental: paperwork reduction in routine business transactions. Some of the routine transactions include purchase orders, invoices, payments, and the like. Memos, letters, interpersonal messages, etc. are not a part of EDI.

An example of EDI is as follows: consider a purchasing environment that is linked with finance and accounting. In such an environment, electronic communication takes place between a buying and a selling company (called trading partners). Purchasing documents are transmitted "over the wire," eliminating the need to generate hard copies and distribute them manually. For all practical purposes, a buyer and a supplier work together in a "real-time" environment that has the potential to reduce costly incoming material delays by shortening procurement lead times. Communication becomes more timely and efficient. This, in turn, allows both the buyer and the supplier to become more market reactive, thereby strengthening their competitive position. Also, automation of purchasing activities through the use of EDI reduces the total cost of purchases, and thereby positively influences a company's profitability. EDI essentially creates a paperless purchasing environment, minimizes administrative and clerical needs, reduces inventory levels, and improves data accuracy. Generally speaking, EDI increases productivity.

## WHAT IS EC/EDI?

### History of EDI

The concept of electronic data interchange was created by Edward Guilbert, who, as director of traffic for the 1948 Berlin airlift, found it terribly frustrating to cope with business transactions on paper. The documents describing the goods arrived days after the goods had already reached Berlin. During the Hungarian airlift eight years later, Guilbert improved the process and would not let a plane take off unless relevant information preceded it. It was not until 1966 that he could apply his international experience domestically. While working for the Department of Transportation, he established an Office of Facilitation to give business managers a chance to tell the government how business could improve its productivity if the government would ease up slightly on the bureaucracy. Impressed by the response, Guilbert thought it would be a good idea if business formed the Transportation Data Coordinating Committee (TDCC) to support the standardization of tariffs for overseas shipments.

With a $50,000 budget and one full-time employee, TDCC started out with a mission to convince businesses that it is far better to do business via a computer than on paper. TDCC established four ground rules, still valid, for electronic data interchange. First, generalized

interface data standards and formats must be responsive to users' needs for intercompany computer-to-computer transactions. Second, the interface capability must be insensitive to internal computer equipment and programs of the interchange parties. Third, EDI should leave to the using parties the selection of communications speeds and services. Fourth, it should have a capability of providing documents, when required, as a by-product of integrated database transactions.

Once these rules were set, TDCC needed to convince businesses to abide by them. Guilbert established task forces of shipper and rail, shipper and motor, shippers/forwarders and ocean carriers, shippers/forwarders and airlines, and shippers/carriers and banks. He had to weave commonalty between each industry's code so the industries could interchange the information. He wove his spell so well that TDCC released in 1975 the first EDI documentation: Rail Transportation Industry Applications. That document became the first of what are currently ten volumes of U.S. EDI standards. There are also separate volumes for the EDI concept, the EDI general programming guide, and the EDI data segments and data elements.

Since the early 1970s, a number of businesses have used proprietary systems to exchange invoices and purchase orders (Newcombe, 1992). Businesses involved in trading operations were quick to recognize the economic advantages of fast, efficient and accurate information flow. Much of the early work on EDI was driven by particular industrial sectors, such as transportation, pharmaceuticals, groceries, automobiles, and banking. Each sector developed its own set of data elements and messages to meet its particular needs, with the result that the various sectors were not able to exchange messages.

By the early 1980s, the need to develop EDI standards that could be used across industry sectors and across national boundaries was recognized and the work to develop the current standards was initiated by standards groups and industry organizations.

A survey of recent business and information systems publications indicates how rapidly EDI is being adopted by business and industry (Tallim & Zeeman, 1993). The current trend towards a global economy adds momentum to the adoption of EDI by emphasizing the need to operate efficiently across industry sectors.

The benefits associated with the adoption of EDI include: (1) less paperwork; (2) fewer errors during the exchange of information; (3) no unnecessary rekeying of data; (4) fewer delays in communication; and (5) improved invoicing and payment process.

**Standards**

The initiative to develop cross-sector EDI standards is centered within two arenas. The Accredited Standards Committee X12 (ASC X12) sanctioned by the American National Standards Institute (ANSI) sets standards for EDI and has developed standardized transaction sets (called messages) that are primarily intended to meet North American needs. Guidelines were developed under the auspices of the United Nations Economic Commission for Europe (UN/ECE), and has established the Electronic Data Interchange for Administration, Commerce, and Transport (EDIFACT). These guidelines are intended to have worldwide applicability and are aimed at international trade.

A dual EDIFACT-ANSI X12 system developed in 1992 serves as the most flexible electronic data interchange system for corporations involved in both domestic and international transactions. The EDIFACT becomes vital for global transactions, particularly in Europe where it is the adopted standard. The ANSI X12, on the other hand, is still the preferred format for the majority of United States corporations. A variety of highly sophisticated EDI management software that facilitate in-house translation and conversion for X12 to EDIFACT, and vice-versa, are available for companies seeking to adopt to dual X12-EDIFACT system. The efficiency of this dual EDI system will depend, to a large extent, on the widespread acceptability by corporations and their banks.

**Uses of EDI Today**

EDI is being used today in a number of industries; (1) manufacturing, (2) banking, (3) healthcare, (4) transportation, (5) pharmaceuticals, (6) automobile, and (7) food are a few examples. In the consumer goods arena, some manufacturers are electronically receiving weekly or daily point-of-sale data from retailers, enabling them to determine more accurate manufacturing schedules, inventory levels, and shipping logistics. Some manufacturers are even determining the product mix on the retailer's shelf. Advanced shipping notices can be sent electronically to retailers' computers as the goods are leaving the manufacturer's dock, enabling retailers to receive and handle goods more efficiently and move goods to the selling floor as needed. By tying the carriers into the electronic loop, both shipper and receiver can know the precise location and delivery schedule of their freight at any time.

Based on the accuracy and timeliness of EDI-based orders and receipts, retailers are beginning to pay at receipt of goods (called evaluated receipts settlement), eliminating the manufacturers' invoicing function and the retailers' accounts payable function.

With the rapid increase in health maintenance organizations (HMOs), managed care contracting, and claims submitted by other providers an entirely new payment need for the healthcare industry has been created . The traditional claims forms being submitted by providers to insurance companies who in turn remitted claim payments has become a smaller percentage of total payments. Much of the document processing done today involves set fees (based on total lives covered) called capitation payments. These capitation payments are made by HMOs to healthcare providers who in turn send encounter data about services rendered to patients.

HMOs can pay their EDI capable providers by utilizing X12 835 healthcare claim payment/advice transaction set. Providers who are not EDI capable and need to be paid via checks along with the explanation of benefits (EOB) statements, can be paid by outsourcing check writing services to the HMO's bank. Most EDI capable banks offer this service as part of their suite of EDI customer services.

The pressures for providers to cut costs are enormous. There is not enough margin in capitation payments to accommodate expensive paper and telephone-based information exchanges. The use of EDI in managed care will transform the way healthcare is managed while at the same time allowing lower administrative cost and staffing needs.

**Financial EDI**

In a memorandum of October 26,1993, President Clinton noted that moving to an electronic commerce (EC) system to simplify and streamline the acquisition process will promote customer service and cost effectiveness. The electronic exchange of acquisition information between the private sector and the Federal government (i.e., the use of EC) will increase competition. It will do so by improving access to Federal contracting opportunities for the more than 300,000 suppliers currently doing business with the Federal government, particularly small businesses and many other suppliers who find access to bidding opportunities difficult under the current system.

To these ends, the President set forth the following objectives for EC:

- Exchange acquisition information electronically between the private sector and the Federal government to the maximum extent practicable;

- Provide businesses, including small, small disadvantaged, and women-owned businesses, with greater access to Federal acquisition opportunities;

  Federal government's EC system;

- Employ nationally and internationally recognized data formats that serve to broaden and ease the interchange of data; and

- Use agency and industry systems and networks to enable the government and potential suppliers to exchange information and access Federal acquisition data.

To implement EC and to achieve his objectives for EC, the President set forth the following four milestones:

- By March 1994, define the architecture for the government-wide EC acquisition system and identify executive departments or agencies responsible for developing, implementing, operating, and maintaining the Federal electronic system

- By September 1994, establish an initial EC capability to enable the Federal government and private suppliers to electronically exchange standardized requests for quotations (RFQs), quotes, purchase orders, and notice of awards and begin government-wide implementation.

## ORACLE INTEGRATION WITH EC/EDI

### How LLNL Decided to Implement

The memo form President Clinton was a driving force to employ EC/EDI at Lawrence Livermore National Laboratory (LLNL). It didn't take a rocket scientist to recognize however that the DOE budget at LLNL was declining, we needed to cut costs and work smarter. EDI afforded us the opportunity to attain both goals. In the spring of 1994 a task group was formed to analyze the various entities which were issuing payments of any form from LLNL to outside persons or organizations, internal departments, divisions, or employees. From that analysis, the task group was to determine how we could effectively make these payments using a uniform internal process and a uniform external process. The internal process was decided to be the Oracle Accounts payable system. The external process would be EC/EDI.

The internal process was planned with the idea that all entities making payments at LLNL also required periodic reporting of those transactions to the Oracle General Ledger system. A schematic was designed to depict the flow of information from payroll, travel accounting, miscellaneous disbursements, etc. to the Oracle Accounts payable system. Rather than tackle the laboratory-wide payment process, we decided to start with small steps, achieve small success, and establish proof of concept. We wanted to convert our current check printing process into and EDI payment process.

The first step in doing so is to establish who the potential trading partners will be. We ran a report from our Oracle database listing the high volume vendors according to number of average invoices processed per month and average total dollar value transacted. From that list we chose the three high volume vendors who have EDI capable banks. The next step was to set up a trading partner agreement with these vendors. In doing that we establish how the payments will be made, when, to which bank account, what bank routing identifier, etc. Once this information has been collected, we can enter the data into the Oracle Accounts Payable vendor profile. At this point the vendor has become an EDI capable vendor rather than a vendor for which a check is issued.

Before an EDI payment batch run can occur, we have to send a vendor prenotification to the bank. This is done using an ANSI X12 820 payment/advise with zero dollar amount. This alerts the bank that a new vendor will be coming through the system and in turn the bank can verify that the account number are in fact correct and log the vendor into their vendor profile directory. The Oracle release 10.4 produces a remittance advice report and an EFT bank file. The EFT bank file however is formatted using the European BACS format which is not the standard for domestic trading. We had to develop a customized output that includes the information needed for the ANSI X12 820 payment/advice transaction set. The data items included in the customized file included the vendor name and address, bank account number,

band routing number, LLNL bank account and bank routing, invoice number and date, effective payment date and total amount paid. Once this information is accumulated, it can then be sent to the EC/EDI translator for conversion into ANSI X12 standardized transaction sets.

**Mapping**

Once the data needed from the Oracle Accounts Payable system is formulated, it is sent to the Government Acquisition Through Electronic Commerce (GATEC) hub at LLNL where data mapping occurs. At he hub, the file is parsed into its various data fields and placed into standardized transaction segments for creating an 820 payment/advice.

These 820 transactions are then taken through an encryption process to make them secure from the possibility of intrusion during the transmittal process between LLNL and the bank. The transactions traveling to the bank are encrypted, placed in an e-mail envelope, and stamped with the bank's e-mail address.

**VANS**

LLNL was in many ways lucky to have the GATEC hub already established on site. This hub provided two things for us: (1)a translator to transform raw payment data into standardized transactions sets, and (2) versatility to have access to any of a number of established value added networks (VANS) throughout the United States. Value added networks are EDI service providers that translate raw information into standardized transaction sets. They also receive information from vendors replying to an LLNL transaction or sending an original transaction to LLNL. Any transactions containing syntax errors are trapped at the hub and sent back to the originator. All clean transactions are formatted in a predesigned fashion and sent to the assigned recipient.

**Vendors**

As mention earlier, vendors chosen by LLNL to be participants in the first implementation of EC/EDI are high volume vendors. We produced a vendor activity report to determine those vendors who have the largest number of transactions in a month and those that have the highest dollar volume of activity. Then the business project manager began calling each vendor to see if they would be interested in becoming EDI trading partners. If they were interested we needed to know if their bank is EDI capable or not. Those who are EDI capable can participate as EDI trading partners.

**Outsourcing**

LLNL chose to get out of the check writing business as completely as practicable. We decided that vendors that were not EDI capable would receive checks issued by the bank as part of their EDI suite of services. It was more economical to have the bank print checks than to do them in-house. Our cost for writing a check was approximately $1.25 each. The cost for outsourcing totaled $ .72 including mailing label.

**Other Oracle Modules**

An other process utilizing EC/EDI is the Oracle Government Purchasing module. At LLNL, the Government Purchasing module of Oracle Financials is not yet in production. We have a bridge to join the in-house purchasing system with our Oracle Financials package.

When the Oracle Government Purchasing is installed, we will be able to share like information concerning purchase orders, payments, changes to purchase orders, etc. Our goal is to have purchase orders, invoices and payment processed via EC/EDI.

## COMMUNICATIONS NETWORK

### Internet

There are a number of ways in which EC/EDI can be handled for message transfer. One way is to have a dedicated leased line connecting the business unit with the bank. Another method involves the use of a simple telephone line connecting the business unit and the bank. If a file transmission is to occur, the originating institution is required to dial the bank, connect to their computer and transmit the file. The third way is to use the Internet to transmit the EC/EDI data. This is an inexpensive way to do business and it allows open access to many new vendors who may be potential customers or trading partners.

One issue surrounding the use of the Internet however is the level of security needed to ensure that data traveling to the bank and back will not be intercepted, read, changed, or in any way compromised.

We are currently using RSA public and private key encryption to ensure the integrity of the data and to authenticate LLNL as the bona fide sender of the information.

### Electronic Mail

As it was mentioned before, once the EC/EDI data has been successfully encrypted, it must be packaged in an e-mail envelope and sent to the bank. All transactions for one day are sent via one singe e-mail transmission over the Internet. The bank in turn receives the mail, opens the envelope, uses their private key to decrypt the information then feed the data into their EC/EDI application. The bank will also send verification of a successful interchange to the LLNL hub via the ANSI X12 997 transmission acknowledgment transaction. All errors, rejects and confirmation of good transactions are handled via ANSI X12 824 payment/advice transaction.

We are also planning to record the status of the payments back into the Oracle database according to the information received in the X12 824 payment/advice transaction. In case of inquiries from vendors or other interested parties, regarding payments due, the accounts payable staff will be able to respond with the latest information.

### Security

Security has been a serious issue at LLNL. We are very aware of the possibilities of hackers gaining access to passwords, encryption keys, databases, programs, etc. The EC/EDI development team conducted a risk assessment to determine the requirements to ensure a safe environment to transact an EC/EDI process. We chose to separate the translation process from the transmission process and put each process on a separate computer. Then we installed security software that tracks all logins, logouts, file modifications, and processes running on the machines 24 hours a day 7 days a week.

By separating the functions operating on each machine, we expect to further eliminate the possibility of unauthorized access.

### Mosaic

Mosaic is currently being used at LLNL as a method of disseminating widely used information. One of the most recent uses of the tool has been to create a Mosaic home page for stores catalog. This allows LLNL employees access to the most current list of general stores items and facilitates miscellaneous orders of goods. It has proven to be a very useful tool for LLNL.

Some future plans for Mosaic's use include facilitating the processing of invoices requiring certification prior to payment. These invoices will be posted to their respective

departments for approval and digital signature. Once this is done, the invoice is posted back to accounts payable for payment processing.

## ISSUES

### Management Commitment

The first and foremost issue surrounding the implementation of EC/EDI at any facility is the commitment of management to support the effort. This must be a top down level of support in order for the implementation to occur smoothly. EC/EDI is not the responsibility of a single group or a single department. Many departments must work together to ensure its success which makes it very critical to have the commitment and shared vision of management level authority in each department.

### Cost Justification

Cost justification is also critical. It is in essence the forerunner to gaining management commitment. There are many advantages to employing EC/EDI; some of which are labor cost savings, administrative cost savings, improved data integrity, lower error percentages, more timely payments, more efficient use of funds, more efficient check writing processes, reduced data entry, and the list goes on. We were able to justify our implementation through savings in check writing and improved data integrity.

### Multiple VANS

The use of multiple VANs is highly recommended. The more VANS available for access implies a larger vendor/customer base. Be aware of the need to avoid being disconnected from otherwise open opportunities because of a choice to do business with a very limited VAN. VANs can open up a world of opportunity by providing access to directories of vendors and banks world wide which may be able to supply the products needed at competitive prices.

### Fully Integrated Systems

It is of the utmost of importance to have fully integrated internal systems. Accounts payable, procurement, general ledger, billing, shipping, receiving, and marketing should all share common data and the data should be consistent throughout. EC/EDI entails an integrated system methodology. Through EC/EDI, the internal integration turn into external integration so that one company's computer system is sharing common information with another company's computer.

### Business Process Reengineering

According to the Office of Technological Assessment, "Many business and government leaders look to information and communication technologies to help American business regain its competitive position and adapt to its rapidly changing economic environment. Experience to date, however, demonstrates that technology alone will not be enough. In cases where technology has made a critical difference it has been employed in conjunction with successful organizational change... Most obstacles to success have been organizational rather than technological. To develop appropriate technology-based strategies that are sufficiently responsive to the fundamental changes taking place around them, businesses will need to reengineer their business relationships and their ways of thinking about the nature of the business enterprise itself.

Many analysts agree that information and communication technologies will not yield substantial gains unless American businesses use them to instigate major organizational change.

Embodying social relations and supporting social interactions, communication and information technologies are indeed powerful forces for change. However, if they are to have their intended effect, new technologies will need to be carefully integrated into their organizational environment, taking full account and advantage of the way people work, learn, and innovate. These technologies will also need to revolutionize the mind-set of those working within business organizations, awakening them to the full range of new organizational possibilities. The lack of mutual adaptation will serve to undermine these efforts."

In implementing EC/EDI be prepared to reengineer the way business is currently being conducted. Be willing to throw away the old paradigm of "we've always done it this way" and replace it with "why can't we do it differently," or "why is this being done at all?" We must learn to think along the line of a global marketplace and realize that the market is at our fingertips when we login to the computer.

We must rethink the function that is being performed, the process by which we are performing the function and the staff required to do it. Don't be reluctant to change but don't change merely for the sake of change. Take the time to set goals for your organization, design a path by which they can be achieved, build a team around those goals and go for it!

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